

REMARKS/ARGUMENTS

Reconsideration is respectfully requested of the Final Office Action of September 2, 2005.

The foregoing amendment is presented for the purpose of placing the application in condition for allowance or, alternatively, in better condition for appeal.

Applicants acknowledge with appreciation that all of the references previously relied on in the Office Action of November 18, 2004, and the rejections based thereon, have been withdrawn.

It will be noted that a more detailed title is presented herewith in accordance with the Examiner's request for a more descriptive title.

With entry of this amendment, the claims in the case will be 1, 3, 5-7, 9, 10, 13, 21 and 22. claims 1, 3, 9, 10 and 22 have been amended to further clarify the features of the present invention.

claim 3 has been revised into independent form and includes the features of claims 1, 13 and 16.

claim 9 has been revised into independent form and includes the features of claims 1 and 16.

claim 10 has been amended as suggested by the Examiner and therefore overcomes the rejection of that claim under the second paragraph of 35 U.S.C. § 112.

The rejection of claim 22 under 35 U.S.C. § 112 (first paragraph) is traversed and reconsideration is respectfully requested. Applicants continue to contend that claim 22 is

adequately supported by the written description on page 9, line 21 to page 10, line 8, as well as Figs. 2 and 3, along with the description thereof on page 9, lines 8 to 20. Kindly also note that the description on page 9, line 16, and page 10, line 1, has been amended to clarify the terminology as to the axial direction of the vehicle.

The claim amendments are fully supported by the original claims and the specification. No new matter has been added. The Examiner is respectfully requested to reconsider and withdraw the outstanding objections and rejections in view of the remarks contained herein.

The feature of the present claim 1, namely, the optical axes of main camera and sub-camera being inclined with an angle such that the three-dimensional distance distribution is substantially left-right symmetric with respect to a shooting direction is not disclosed or suggested by the cited references.

The structure of the cited reference, *Burt* (US 5,473,364), is that "stereo-vision mode" and "motion-detection mode" are switched. In "stereo-vision mode", as shown in Fig. 4b and col. 5, lines 40-51, optical axis of each of camera is directed into a direction perpendicular to the base line of the camera to obtain the stereo image. That is, the optical axis of each camera is parallel to the shooting direction.

In "motion-detection mode", as shown in Fig. 4a, the optical axis of each camera is inclined with respect to the shooting direction; however, *Burt* '364 does not disclose that in the "motion-detection mode", (Fig. 4c) a stereo image is obtained.

Further, in "stereo-vision mode", shown in Fig. 4b, it is not disclosed that the inclination of each camera is inclined with respect to the shooting direction as shown in Fig. 4a.

The Examiner stated that the structure of the present invention “the three-dimensional distance distribution being substantially left-right symmetric with respect to a shooting direction” is inherently in *Burt* ‘364. The Official Action refers to Fig. 4a of *Burt*, but there is no explanation of why that feature must necessarily be present in the system of *Burt*.

Moreover, *Burt* ‘364 does not disclose that, when the stereo image is obtained, the optical axis of each camera is inclined with respect to the shooting direction. Thus, the structure such that the three-dimensional distance distribution is substantially left-right symmetric with respect to a shooting direction has not been shown to be inherently included in the structure of *Burt* ‘364.

The secondary reference, *Iijima* (US 6,236,748), also fails to disclose or suggest the above-mentioned structure of the present claim 1.

Therefore, the differences between the cited references and the present invention based on the above-mentioned feature of the present invention, which is not disclosed in any cited reference, together with its effect such that the three-dimensional distance distribution is substantially left-right symmetric are such that the subject matter as a whole would not have been obvious to the skilled worker at the time of the invention.

Further, claim 1 has been amended to incorporate the subject matter of claim 16, and specifies both cameras are inclined with an angle such that the three-dimensional distance distribution is substantially left-right symmetric with respect to a central axis of a vehicle. This feature is not disclosed or suggested in any cited reference.

It appears from the record that the expression “central axis of the vehicle” of the present invention is understood as an axis being parallel to the shooting direction and passing through the center of the vehicle. However, the “central axis of the vehicle” of the present invention

indicates an axis parallel to the front-rear direction of the vehicle and an axis parallel to the shooting direction.

Further, the Office Action seems to indicate that the “area” in the former claim 16 is an area which both the main camera and the sub-camera take a photograph of. However, the “area” as defined by the present invention is a three-dimensional distance distribution generated by the image processing section.

Therefore, the amendment to claim 1 clarifies the “central axis of vehicle” and the “area”.

Claim 3, and its dependent claim 13, has the feature of “the optical axis of the sub-camera is inclined toward the sub-camera side with respect to the optical axis of the main camera”.

The cited reference *Iijima* discloses providing a search margin within the comparison image, and also discloses that the optical axis of the sub-camera is inclined toward to the sub-camera side with respect to the optical axis of the main camera. Further, the cited reference *Iijima* discloses setting the search margin for absorbing the deviation occurred by the attachment of cameras.

However, neither of the cited references show or suggest the feature of “the optical axis of the main camera and the optical axis of the sub-camera being inclined toward the main camera side, and the optical axis of the sub-camera is inclined toward the sub-camera side with respect to the optical axis of the main camera”.

Further, claim 3 has been amended by including the subject matter of claim 16. The feature of “both cameras are inclined so that the three-dimensional distance distribution is substantially left-right symmetric with respect to a central axis of a vehicle” is not disclosed in either of the cited references.

substantially left-right symmetric with respect to a central axis of a vehicle” is not disclosed in either of the cited references.

With respect to claim 9, this claim defines the structure of claim 3 by using a different expression.

The Examiner stated that claim 22 is suggested in the cited reference of *Iijima* ‘748.

Attention is invited to Fig. 9b of the *Iijima* ‘748, where the left portion of the figure indicates a three-dimensional distance distribution is found in a range which is obtained by eliminating (c) and (d) areas from the main image. From the same drawing, the difference between the first line which makes the three-dimensional distance distribution left-right symmetric, and the second line which divides the reference image into two parts, becomes zero, and the inclination angle of the main camera and sub-camera becomes zero.

However, as mentioned in col. 7, lines 38-40 of the *Iijima* ‘748 reference, the range of the reference image of *Iijima* ‘748 is a range obtained by eliminating the range (c) which is actually not taken a photograph of. Therefore, in the structure of *Iijima* ‘748, there occurs a difference between the first and second lines.

Iijima ‘748 does not disclose that the main camera and sub-camera are inclined toward the main camera side with angle corresponding to such a difference, and the structure of *Iijima* ‘748 is such that the three-dimensional distance distribution is not left-right symmetric.

Applicants respectfully submit that this amendment and the above remarks obviate the outstanding objections and rejections in this case, thereby placing the application in condition for immediate allowance. Allowance of this application is earnestly solicited.

Respectfully submitted,

SMITH, GAMBRELL & RUSSELL, LLP

By: 
Robert G. Weilacher, Reg. No. 20,531

Suite 3100, Promenade II
1230 Peachtree Street, N.E.
Atlanta, Georgia 30309-3592
Telephone: (404) 815-3593
Facsimile: (404) 685-6893

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of the reference image as shown in Fig. 2C. Therefore, an area in which a three-dimensional distance distribution is generated by the image processing unit 6 is inclined toward the left side (toward the sub-camera 5 side) of the reference image as shown 5 in Fig. 2D.

Taking into account the above problem, special consideration is given to a structure for mounting the main camera 4 and the sub-camera 5 on the camera stay 3 in the stereo camera unit 2 of the present embodiment. Specifically, the aforementioned main camera 4 and sub-camera 5 are assembled to the camera stay 3 in such a way that their optical axes 01, 02 are inclined by angles θ_1, θ_2 toward the main camera 4 side (rightward), respectively, as shown in Fig. 3. In other words, the camera stay 3 is installed in vehicle interior such that its longitudinal direction would become perpendicular to the ~~central axis~~ axial direction of the vehicle (shooting direction) as shown in Fig. 1 and, therefore, the optical axes 01, 02 of the aforementioned main camera 4 and sub-camera 5 are inclined rightward by θ_1, θ_2 with respect to their shooting direction, respectively.

This is for setting an area of a three-dimensional distance distribution, which is offset toward the sub-camera 5 side(leftward) within the horizontal view angle of the main camera.4, substantially symmetrically on left and right sides of the

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~~central axis~~ axial direction of the vehicle as shown in Fig. 1. As a result, although the area of the three-dimensional distance distribution generating area is still offset toward the sub-camera 5 side (leftward) on the reference image as shown in Fig. 2D, the area of the three-dimensional distance distribution produced by the image processing unit 6 is well balanced showing left-right symmetry with respect to own vehicle.

On the other hand, the angle of inclination θ_1 of the main camera 4 and the angle of inclination θ_2 of the sub-camera 5 are determined to satisfy the relationship $\theta_1 > \theta_2$. In other words, the optical axis 02 of the sub-camera 5 is set such that it is inclined toward the sub-camera 5 side (leftward) with respect to the optical axis 01 of main camera 4. This arrangement is made to provide a search margin in the comparative image to enable detection of an infinite distance corresponding point in stereo matching executed by the image processing unit 6 by setting a left end of the comparative image to the outside (leftward) of a left end of the reference image. It is to be noted, however, that such a setting exerts its effects when the reference image is produced using up to extreme ends of camera frame.

The angles of inclination θ_1 , θ_2 of the aforementioned main camera 4 and sub-camera 5 are optimally set depending on